

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (Currently Amended) A method of queuing InfiniBand receive
- 2 traffic, comprising:
 - 3 maintaining a single contiguous memory structure for queuing InfiniBand
 - 4 traffic received via multiple virtual lanes and multiple queue pairs;
 - 5 queueing one or more InfiniBand Send commands in a single queue,
 - 6 wherein each said Send command comprises an encapsulated communication;
 - 7 queueing a set of InfiniBand RDMA Read descriptors in said single queue;
 - 8 selecting an entry in said single queue, wherein said entry comprises a
 - 9 Send command or a set of said RDMA Read descriptors;
 - 10 if said selected entry is a set of said RDMA Read descriptors:
 - 11 issuing a set of RDMA Read requests to retrieve portions of a
 - 12 communication described by said RDMA Read descriptors; and
 - 13 as RDMA Read responses are received in response to said RDMA
 - 14 Read requests, assembling said described communication in said single
 - 15 queue; and
 - 16 forwarding a communication associated with said selected entry, for
 - 17 transmission on an external communication link, wherein said communication is
 - 18 one of:
 - 19 said encapsulated communication if said selected entry is a Send
 - 20 command; and
 - 21 said described communication if said selected entry is a set of

22 RDMA Read descriptors.

1 2. (Cancelled)

1 3. (Currently Amended) The method of claim 23, wherein said single
2 queue comprises one or more linked lists of memory buffers within said single
3 memory structure.

1 4. (Currently Amended) The method of claim 1, further comprising:
2 maintaining an assembly area of said single queue, in which said described
3 communication is assembled; and
4 maintaining a queuing area of said single queue, in which said one or more
5 Send commands and said set of RDMA Read descriptors are queued.

1 5. (Original) The method of claim 4, wherein said RDMA Read
2 responses are placed directly into said assembly area upon receipt.

1 6. (Currently Amended) The method of claim 4, further comprising, if
2 said selected entry is a set of RDMA Read descriptors:
3 appending space to said assembly area of said single queue based on an
4 expected size of said described communication.

1 7. (Currently Amended) The method of claim 4, further comprising:
2 maintaining a first head pointer configured to identify a head of said
3 assembly area of said single queue;
4 maintaining a first tail pointer configured to identify a tail of said assembly
5 area of said single queue;
6 maintaining a second head pointer configured to identify a head of said

7 queuing area of said single queue;
8 maintaining a second tail pointer configured to identify a tail of said
9 queuing area of said single queue; and
10 maintaining a next entry pointer configured to identify a next entry in said
11 single queue to be processed after said forwarding.

1 8. (Original) The method of claim 7, wherein said first head pointer is
2 further configured to identify a beginning of said communication.

1 9. (Currently Amended) The method of claim 7, wherein said second
2 tail pointer is configured to identify where in said single queue a next Send
3 command or set of RDMA Read descriptors is to be queued.

1 10. (Original) The method of claim 1, further comprising:
2 maintaining a set of pointers configured to identify a beginning and an end
3 of said communication.

1 11. (Currently Amended) The method of claim 10, wherein said set of
2 pointers includes a head pointer configured to identify a head of said single queue.

1 12. (Original) The method of claim 1, wherein said assembling
2 comprises dropping an RDMA Read response received out of order.

1 13. (Currently Amended) A computer readable medium storing
2 instructions that, when executed by a computer, cause the computer to perform a
3 method of queuing InfiniBand receive traffic, the method comprising:
4 maintaining a single contiguous memory structure for queuing InfiniBand
5 traffic received via multiple virtual lanes and multiple queue pairs;

6 queuing one or more InfiniBand Send commands in a single queue,
7 wherein each said Send command comprises an encapsulated communication;
8 queuing a set of InfiniBand RDMA Read descriptors in said single queue;
9 selecting an entry in said single queue, wherein said entry comprises a
10 Send command or a set of said RDMA Read descriptors;
11 if said selected entry is a set of said RDMA Read descriptors:
12 issuing a set of RDMA Read requests to retrieve portions of a
13 communication described by said RDMA Read descriptors; and
14 as RDMA Read responses are received in response to said RDMA
15 Read requests, assembling said described communication in said single
16 queue; and
17 forwarding a communication associated with said selected entry, for
18 transmission on an external communication link, wherein said communication is
19 one of:
20 said encapsulated communication if said selected entry is a Send
21 command; and
22 said described communication if said selected entry is a set of
23 RDMA Read descriptors.

1 14. (Currently Amended) The computer readable medium of claim 13,
2 wherein the method further comprises:
3 maintaining an assembly area of said single queue, in which said described
4 communication is assembled; and
5 maintaining a queuing area of said single queue, in which said one or more
6 Send commands and said set of RDMA Read descriptors are queued.

1 15. (Currently Amended) The computer readable medium of claim 14,
2 wherein the method further comprises, if said selected entry is one of said RDMA
3 Read commands:
4 appending space to said assembly area of said single queue based on an
5 expected size of said described communication.

1 16. (Currently Amended) The computer readable medium of claim 15,
2 wherein the method further comprises:
3 maintaining a first head pointer configured to identify a head of said
4 assembly area of said single queue;
5 maintaining a first tail pointer configured to identify a tail of said assembly
6 area of said single queue;
7 maintaining a second head pointer configured to identify a head of said
8 queuing area of said single queue;
9 maintaining a second tail pointer configured to identify a tail of said
10 queuing area of said single queue; and
11 maintaining a next entry pointer configured to identify a next entry in said
12 single queue to be processed after said forwarding.

1 17. (Currently Amended) A method of queuing multiple types of
2 traffic in a single receive queue of a communication interface, the method
3 comprising:
4 maintaining a single contiguous memory structure for queuing InfiniBand
5 traffic received via multiple communication streams;
6 queuing a first entry comprising a first communication forwarded to the
7 communication interface by a host;
8 queuing a second entry comprising a set of descriptors configured to

9 describe a second communication stored on the host;
10 processing said first entry, wherein processing said first entry comprises:
11 determining whether said first communication is complete; and
12 forwarding said first communication to a communication module
13 for transmission; and
14 processing said second entry, wherein processing said second entry
15 comprises:
16 issuing requests to obtain portions of said second communication
17 described by said descriptors;
18 assembling said second communication in said single queue; and
19 forwarding said second communication to the communication
20 module for transmission.

1 18. (Original) The method of claim 17, wherein processing said second
2 entry further comprises:
3 determining whether said second communication has been fully
4 assembled.

1 19. (Original) The method of claim 17, further comprising:
2 maintaining a queuing area for queuing Send commands; and
3 maintaining an assembly area for assembling said second communication
4 from said portions of said second communication.

1 20. (Original) The method of claim 19, wherein processing said second
2 entry further comprises:
3 placing said portions of said second communication directly into said
4 assembly area upon receipt.

1 21. (Original) The method of claim 17, further comprising:
2 forwarding a previous communication to the communication module; and
3 selecting whichever of said first entry and said second entry has been
4 queued for the longest time.

1 22. (Currently Amended) The method of claim 21, wherein said
2 selecting comprises advancing a next entry pointer to the next entry in the single
3 receive queue.

1 23. (Original) The method of claim 22, wherein said selecting further
2 comprises reading a portion of a payload of said next entry to determine a traffic
3 type of said next entry.

1 24. (Currently Amended) The method of claim 17, wherein the single
2 receive queue comprises a set of linked memory buffers within said a single
3 contiguous memory structure configured as queues for one or more InfiniBand
4 queue pairs.

1 25. (Currently Amended) The method of claim 24, wherein processing
2 said second entry further comprises:
3 appending one or more free memory buffers of the single contiguous
4 memory structure to the single receive queue;
5 wherein said assembling comprises assembling said second
6 communication in said one or more memory buffers.

1 26. (Currently Amended) A computer readable medium storing
2 instructions that, when executed by a computer, cause the computer to perform a
3 method of queuing multiple types of traffic in a single receive queue of a

4 communication interface, the method comprising:
5 maintaining a single contiguous memory structure for queuing InfiniBand
6 traffic received via multiple communication streams;
7 queuing a first entry comprising a first communication forwarded to the
8 communication interface by a host;
9 queuing a second entry comprising a set of descriptors configured to
10 describe a second communication stored on the host;
11 processing said first entry, wherein processing said first entry comprises:
12 determining whether said first communication is complete; and
13 forwarding said first communication to a communication module
14 for transmission; and
15 processing said second entry, wherein processing said second entry
16 comprises:
17 issuing requests to obtain portions of said second communication
18 described by said descriptors;
19 assembling said second communication in said single queue; and
20 forwarding said second communication to the communication
21 module for transmission.

1 27. (Original) The computer readable medium of claim 26, wherein the
2 method further comprises:
3 maintaining a queuing area for queuing Send commands; and
4 maintaining an assembly area for assembling said second communication
5 from said portions of said second communication.

1 28. (Original) The computer readable medium of claim 27, wherein
2 processing said second entry further comprises:
3 placing said portions of said second communication directly into said

4 assembly area upon receipt.

1 29. (Currently Amended) An apparatus for queuing multiple types of
2 receive traffic in a communication interface, comprising:

3 a single queue for queuing multiple types of receive traffic commands,
4 wherein each said command is associated with a communication to be transmitted
5 from the communication interface;

6 a single contiguous memory structure shared by multiple communication
7 streams;

8 a head pointer configured to identify a head of said single queue;

9 a tail pointer configured to identify a tail of said single queue, wherein said
10 traffic commands are enqueued at said tail; and

11 a next entry pointer configured to identify a next entry in said single queue
12 to be processed.

1 30. (Currently Amended) The apparatus of claim 29, wherein said
2 single queue comprises an assembly area for assembling a communication
3 associated with a first type of receive traffic command.

1 31. (Currently Amended) The apparatus of claim 30, wherein said
2 single queue further comprises a queuing area for queuing a second type of
3 receive traffic command.

1 32. (Original) The apparatus of claim 31, wherein said assembly area
2 and said queuing area are each delimited by a head pointer and a tail pointer.

1 33. (Original) The apparatus of claim 30, wherein said first type of
2 receive traffic command is an InfiniBand Send command comprising a set of

3 RDMA read descriptors configured to identify the communication associated with
4 said first type of receive traffic command.

1 34. (Original) The apparatus of claim 33, wherein a second type of
2 receive traffic command is an InfiniBand Send command configured to
3 encapsulate the communication associated with said second type of receive traffic
4 command.

1 35. (Original) The apparatus of claim 30, wherein:
2 said first type of receive traffic command comprises a set of descriptors,
3 wherein each said descriptor is configured to describe a portion of the
4 communication associated with said command; and
5 the apparatus is configured to issue read requests to retrieve the portions of
6 the communication described by the set of descriptors and assemble said portions
7 in said assembly area.

1 36. (Currently Amended) The apparatus of claim 29, further
2 comprising:
3 a transmit module configured to transmit the communications associated
4 with said receive traffic commands;
5 wherein each communication associated with a receive traffic command is
6 forwarded from said single queue to said transmit module after the
7 communication is determined to be complete.

1 37. (Currently Amended) The apparatus of claim 36, wherein a
2 communication is forwarded from said queue to said transmit module by passing
3 to the transmit module a set of pointers delimiting the communication within said
4 single queue rather than passing the communication.

1 38. (Currently Amended) The apparatus of claim 29, wherein said
2 single queue comprises one or more linked lists of buffers within a single
3 contiguous memory structure configured to queue receive traffic for multiple
4 communication connections.

1 39. (Currently Amended) A method of maintaining ordering of
2 transmission of outbound communications from an InfiniBand channel adapter,
3 the method comprising:

4 receiving on a first queue pair a first InfiniBand packet payload comprising
5 a set of RDMA (Remote Direct Memory Access) Read descriptors describing a
6 first communication;

7 after receiving said first InfiniBand packet, receiving on the first queue
8 pair a second InfiniBand packet payload comprising a portion of a second
9 communication;

10 after receiving said second InfiniBand packet, processing said first
11 InfiniBand packet payload by:

12 dispatching RDMA Read requests corresponding to said set of
13 RDMA Read descriptors;

14 receiving responses to said RDMA Read requests, said responses
15 comprising portions of the first communication;

16 assembling the first communication; and

17 transmitting the first communication from the channel adapter; and

18 only after said processing said first InfiniBand packet, processing said
19 second InfiniBand packet; and

20 maintaining a single contiguous memory structure for queuing InfiniBand
21 traffic received via multiple communication streams.-

1 40. (Original) The method of claim 39, wherein said processing said

2 second InfiniBand packet comprises transmitting the second communication from
3 the channel adapter.

1 41. (Currently Amended) The method of claim 39, wherein:
2 said receiving a first InfiniBand packet payload comprises queuing said
3 first InfiniBand packet payload in a first portion of a single queue associated with
4 the first queue pair; and
5 said receiving a second InfiniBand packet payload comprises queuing said
6 second InfiniBand packet payload in the first portion of the single queue.

1 42. (Currently Amended) The method of claim 41, wherein said
2 assembling comprises:
3 assembling said portions of the first communication in a second portion of
4 the single queue.